

LETTER TO THE EDITOR

Open Access



# Choroidal thickness changes measured by enhanced depth imaging optical coherence tomography in third trimester pregnant women

Lorenzo Ferro Desideri<sup>1,3\*</sup>, Fabio Barra<sup>2,3</sup>, Simone Ferrero<sup>2,3</sup> and Aldo Vagge<sup>1,3</sup>

## Abstract

The aim of this article is to underline the effect of pregnancy on the variations of choroidal thickness caused by hormonal and haemodynamic changes.

**Keywords:** Choroid, Choroidal thickness, Pregnancy, Third trimester, Optical coherence tomography, Hormonal changes

Dear editor,

We read with great interest the article “Comparative analysis of choroidal thickness in third trimester pregnant women” recently published in the International Journal of Vitreous and Retina.

In this cross-sectional study Benfica et al. [1] analyzed the measurements of choroidal thickness in healthy third trimester pregnant women in comparison with healthy non-pregnant women using optical coherence tomography (OCT), reporting no statistical difference both in the mean subfoveal choroidal thickness and in the ten different measurements of choroidal thickness in the macula [1]. The authors should be congratulated for the prospective study design, the adoption of the enhanced depth imaging OCT (EDI-OCT) technique, which allows a better visualization of choroidal morphology compared with the traditional spectral-domain OCT (SD-OCT), and for having performed all the scans at the same time in the morning, in order to avoid diurnal variations of choroidal thickness, as already reported in literature [2].

However, we would like to point out some methodological concerns on the findings in this study. Firstly, the authors did not specify if the complete eye examination included slit-lamp biomicroscopy, color fundus photography, axial length and anterior chamber measurements, ophthalmoscopy fundus examination and the measurement of intraocular pressure, central corneal thickness and ocular perfusion pressure (OPP), all parameters that have been shown to affect the choroidal thickness [3]. In this regard, the Beijing Eye Study showed a significant positive association between a thicker choroid and ocular biometric parameters such as a shorter axial length, a deeper anterior chamber depth and a flatter cornea [4]. Moreover, Kim et al. [5] demonstrated that choroid thickness was significantly associated with OPP in healthy subjects. Thus, given the strong effect displayed by the above-mentioned parameters on choroidal thickness, a more detailed disclosure of the ophthalmological examination should have been provided.

Secondly, in this study the authors found a thicker choroid in pregnant women than non-pregnant women, however the results were not statistically significant ( $304.1 \pm 9.6 \mu\text{m}$  in the non-pregnant group vs  $318.1 \pm 15.6 \mu\text{m}$  in the pregnant group,  $p=0.446$ ); these findings could have been limited by the relatively small sample size (27 healthy pregnant women in the examined

\*Correspondence: [lorenzoferrero@gmail.com](mailto:lorenzoferrero@gmail.com)

<sup>3</sup> Department of Neurosciences, Rehabilitation, Ophthalmology, Genetics, Maternal and Child Health (DiNOGMI), University of Genoa, Genoa, Italy  
Full list of author information is available at the end of the article

group and 34 healthy non-pregnant women in the control group) [1]. In fact, Liu et al. [6] reported a meta-analysis evaluating 8 clinical studies a significantly greater choroidal thickness in pregnant women compared with non-pregnant women with the same age. The underlying mechanism behind the increase of choroidal thickness would reside in the haemodynamic and hormonal changes occurring in pregnancy, with an increased blood flow in this tissue combined with a decreased vascular resistance. In fact, the choroid is a tissue rich of vessels, providing the 85% of ocular perfusion and therefore it is the first ocular layer to be affected by the overall increase of blood volume during pregnancy [7].

In conclusion, further larger scale studies with broader sample sizes should be performed, in order to better describe the complex mechanism of choroidal thickness changes during pregnancy.

#### Abbreviations

EDI-OCT: enhanced depth imaging optical coherence tomography; OCT: optical coherence tomography; OPP: ocular perfusion pressure; SD-OCT: spectral-domain optical coherence tomography.

#### Authors' contributions

All the authors contributed to the article. All authors read and approved the final manuscript.

#### Author details

<sup>1</sup> Department of Ophthalmology, Ospedale Policlinico San Martino, Largo R. Benzi 10, 16131 Genoa, Italy. <sup>2</sup> Academic Unit of Obstetrics and Gynecology, Ospedale Policlinico San Martino, Largo R. Benzi 10, 16131 Genoa, Italy. <sup>3</sup> Department of Neurosciences, Rehabilitation, Ophthalmology, Genetics, Maternal and Child Health (DiNOGMI), University of Genoa, Genoa, Italy.

#### Competing interests

The authors declare that they have no competing interests.

#### Availability of data and materials

The datasets generated and/or analysed during the current study are available in the [<https://www.ncbi.nlm.nih.gov/pubmed/>] repository.

#### Consent for publication

Not applicable.

#### Ethics approval and consent to participate

Not applicable.

#### Funding

The authors received no specific funding for this article.

#### Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Received: 21 February 2018 Accepted: 26 March 2018

Published online: 23 April 2018

#### References

- Benfica CZ, Zanella T, Farias LB, Oppermann MLR, Canani LHS, Lavinsky D. Comparative analysis of choroidal thickness in third trimester pregnant women. *Int J Retina Vitreous*. 2018;4:6. <https://doi.org/10.1186/s40942-018-0108-0>.
- Tan CS, Ouyang Y, Ruiz H, Sadda SR. Diurnal variation of choroidal thickness in normal, healthy subjects measured by spectral domain optical coherence tomography. *Invest Ophthalmol Vis Sci*. 2012;53(1):261–6. <https://doi.org/10.1167/iops.11-8782>.
- Roskal-Walek J, Laudanska-Olszewska I, Biskup M, Gierada M, Odrobina D. Choroidal thickness in women with uncomplicated pregnancy: literature review. *Biomed Res Int*. 2017;2017:5694235. <https://doi.org/10.1155/2017/5694235>.
- Wei WB, Xu L, Jonas JB, Shao L, Du KF, Wang S, et al. Subfoveal choroidal thickness: the Beijing Eye Study. *Ophthalmology*. 2013;120(1):175–80. <https://doi.org/10.1016/j.ophtha.2012.07.048>.
- Kim M, Kim SS, Kwon HJ, Koh HJ, Lee SC. Association between choroidal thickness and ocular perfusion pressure in young, healthy subjects: enhanced depth imaging optical coherence tomography study. *Invest Ophthalmol Vis Sci*. 2012;53(12):7710–7. <https://doi.org/10.1167/iops.12-10464>.
- Liu R, Kuang GP, Luo DX, Lu XH. Choroidal thickness in pregnant women: a cross-sectional study. *Int J Ophthalmol*. 2016;9(8):1200–6. <https://doi.org/10.18240/ijo.2016.08.18>.
- Kara N, Sayin N, Pirhan D, Vural AD, Araz-Ersan HB, Tekirdag AI, et al. Evaluation of subfoveal choroidal thickness in pregnant women using enhanced depth imaging optical coherence tomography. *Curr Eye Res*. 2014;39(6):642–7. <https://doi.org/10.3109/02713683.2013.855236>.

Submit your next manuscript to BioMed Central and we will help you at every step:

- We accept pre-submission inquiries
- Our selector tool helps you to find the most relevant journal
- We provide round the clock customer support
- Convenient online submission
- Thorough peer review
- Inclusion in PubMed and all major indexing services
- Maximum visibility for your research

Submit your manuscript at  
[www.biomedcentral.com/submit](http://www.biomedcentral.com/submit)

